Aesth Plast Surg (2017) 41:199–203
DOI 10.1007/s00266-016-0728-4

Ocular Pain and Impending Blindness During Facial Cosmetic Injections: Is Your Office Prepared?

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Received: 6 September 2016 / Accepted: 19 October 2016 / Published online: 28 December 2016
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Abstract Soft tissue filler injections are the second most common non-surgical procedure performed by the plastic surgeon. Embolization of intravascular material after facial injection is a rare but terrifying outcome due to the high likelihood of long-term sequela such as blindness and cerebrovascular accident. The literature is replete with examples of permanent blindness caused by injection with autologous fat, soft tissue fillers such as hyaluronic acid, PLLA, calcium hydroxyl-apatite, and even corticosteroid suspensions. However, missing from the discussion is an effective treatment algorithm that can be quickly and safely followed by injecting physicians in the case of an intravascular injection with impending blindness. In this report, we present the case of a 64-year-old woman who suffered from blindness and hemiparesis after facial cosmetic injections performed by a family physician. We use this case to create awareness that this complication has become more common as the number of injectors and patients seeking these treatments have increased exponentially over the past few years. We share in this study our experience with the incorporation of a "blindness safety kit" in each of our offices to promptly initiate treatment in someone with embolization and impending blindness. The kit contains a step-by-step protocol to follow in the event of arterial embolization of filler material associated with ocular pain and impending loss of vision.
Level of Evidence V This journal requires that authors assign a level of evidence to each article. For a full description of these Evidence-Based Medicine ratings, please refer to the Table of Contents or the online Instructions to Authors www.springer.com/00266.

Keywords Dermal fillers · Blindness · Facial injection · Embolization

Introduction

Soft tissue filler injections are the second most common non-surgical procedure performed by the plastic surgeon [1]. Embolization of intravascular material occurring after facial injection is a rare but terrifying outcome due to the high likelihood of long-term sequela such as blindness and cerebrovascular accident (CVA). The literature is replete with examples of permanent blindness caused by injection with autologous fat, soft tissue fillers such as hyaluronic acid, collagen, PLLA, calcium hydroxyl-apatite, and even corticosteroid suspensions [2–6].

However, there is a paucity of information on the immediate management of impending blindness arising from embolization after cosmetic facial injections within the aesthetic literature. Most articles discussing blindness and CVA as a sequela after facial fillers have been published in the fields of ophthalmology, neurology, and dermatology. Further missing from the discussion is an effective treatment algorithm that can be quickly and safely followed by injecting physicians in the case of an intravascular injection with impending blindness.

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In this paper, we present the case of a 64-year-old woman who suffered from unilateral, right-sided permanent blindness, tissue necrosis of the forehead, and contralateral, left-sided hemiparesis after facial injections with platelet-rich plasma (PRP) by a family physician. The goals of this paper are to: (1) create awareness of the increasing number of cases reporting blindness after cosmetic facial injections, (2) understand the possibility of further complications such as embolic stroke from the filler material, and (3) encourage all physicians performing facial fillers to have a system in place for the immediate management of a patient that develops ocular pain and impending blindness during injection.

In our practice, we have incorporated a "blindness safety kit" in each of our offices to promptly initiate treatment in someone with embolization and impending blindness. The kit contains a step-by-step protocol to follow in the event of arterial embolization since studies have shown that among those patients whose blindness resolved, they were treated within 30 min of the event [7].

Case Report

We report a case of a 64-year-old woman who presented to the emergency department in September 2015 after complaining of severe right eye pain, visual changes, and syncope during a treatment of facial wrinkles in the forehead with PRP. The injections were performed by a family medicine clinician in a nail salon spa in Miami, FL.

The senior author (J.R.F.) was the on-call plastic surgeon at the hospital where the patient was hospitalized. The senior author received the consult 24 h after the onset of symptoms. Upon physical examination, the patient had complete right eye blindness with ischemic changes in the iris, forehead necrosis in the distribution of the supraorbital artery, right eyelid ptosis, and left-sided hemiparesis. The ischemic changes seen in the iris were suggestive of damage to the posterior ciliary circulation, which is seen with very proximal ophthalmic artery occlusions (Fig. 1). The patient had a history of hypertension controlled with a beta-blocker.

Magnetic resonance imaging (MRI) without contrast revealed acute areas of infarct through much of the right middle cerebral artery territory, predominantly involving the superior right temporal lobe, the parietal and occipital lobes, and the cortex and subcortical white matter of the right frontal lobe, which correlated with the patient's left-sided hemiparesis (Fig. 2). Magnetic resonance angiography (MRA) without contrast showed proximal occlusion of the right ophthalmic artery with distal changes associated with ischemia (Fig. 3).

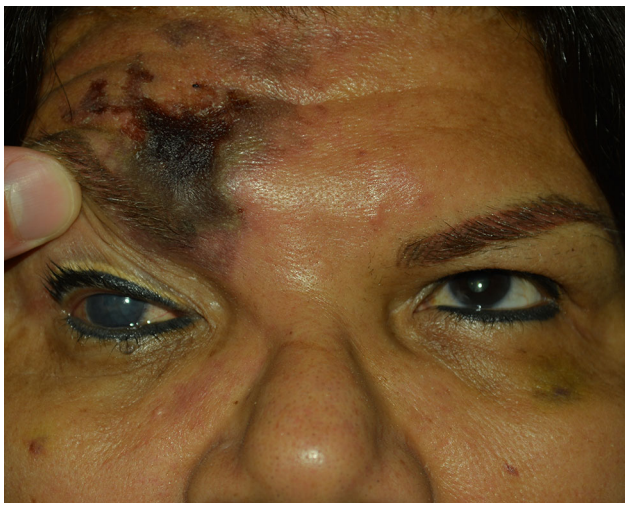

Fig. 1 A 64-year-old woman with signs of ischemia of the iris and forehead necrosis, seen 24 h after onset of *right*-sided visual loss

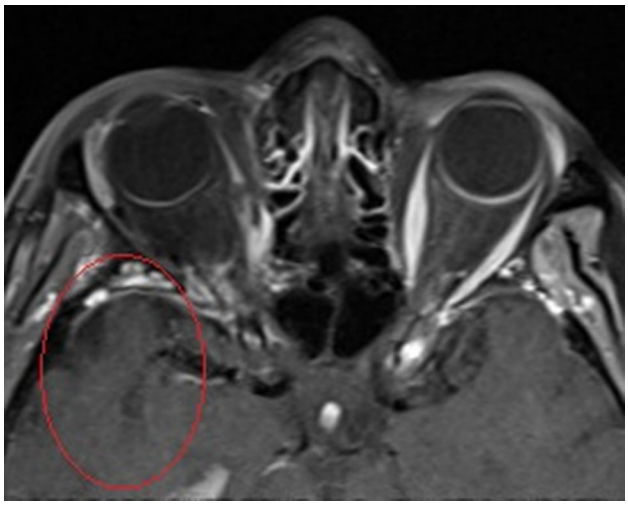

Fig. 2 Magnetic resonance imaging shows acute areas of infarct throughout the *right middle* cerebral artery

The admitting physician performed a full embolic workup. Carotid duplex ultrasound revealed no significant stenosis or plaquing. A transesophageal echocardiogram revealed no evidence of cardioembolic sources or shunting.

The forehead necrosis was conservatively treated with antibiotic ointment. Once healed, the patient received three treatments of pulsed dye laser to the scar. Eight months after the incident, the area had healed well with a slightly hypertrophic scar that will be excised in the future (Fig. 4).

The patient was discharged home with local wound care to the forehead and follow-up with a physical therapist to recover muscle tone from her CVA. The patient improved, but she had some residual weakness of her left upper and lower extremity.

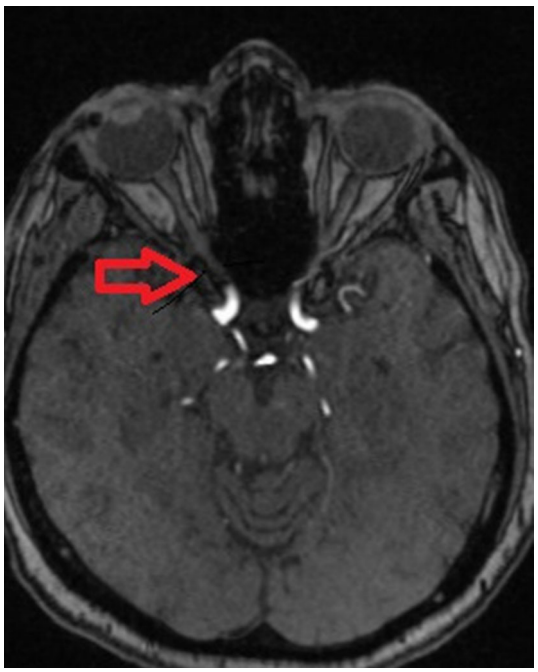

Fig. 3 Magnetic resonance angiography without contrast shows distal ischemic changes associated with proximal occlusion of the *right* ophthalmic artery

Fig. 4 The 64-year-old woman, seen 8 months after the embolic episode, with a slightly hypertrophic scar

Discussion

Our goal is to discuss the mechanism by which blindness and CVA can occur with facial injection, provide ways to minimize the risk of permanent blindness, and propose a treatment algorithm that can be used if a patient suffers from embolization associated with eye pain and vision loss.

Mechanism

One proposed mechanism by which blindness and cerebrovascular ischemia may occur is through direct occlusion of the vessel by intravascular material [8]. The force from injection directly into the arterial space results in higher pressures from the injection that can reverse flow [8, 9]. After an intravascular injection, excessive pressure on the plunger and long injection times can cause a bolus of the viscus material to travel in a retrograde fashion from the arteries of the face (e.g., supraorbital, suprathrochlear, inferior orbital) to the ophthalmic artery, which will then release the embolic material in an anterograde fashion into a smaller terminal artery such as the retinal artery. If a large bore needle and a large syringe are used, the pressure generated could be enough to move the viscous material all the way into the internal carotid artery, which when released could result in embolization to the cerebral circulation resulting in a CVA [8]. Additionally, injection of large volumes of material can overcome the minimum amount of filler necessary to potentiate these complications [10].

For a mechanical occlusion (embolization) to occur, the material deposited intravascularly must be viscous. PRP is not a viscous material, which is a prerequisite to occlude a vessel, and thus it is unlikely it was used in this case. At this time, there have been no cases reported of blindness caused by facial injections of PRP. However, PRP preparations can be injected along with hyaluronic acid. Although it is important to correctly identify the product injected to guide treatment, this case serves to highlight the need for awareness among injectors and staff on the symptoms of impending blindness after facial injection.

The type of arterial occlusion can be further subdivided into diffuse or localized based on the location of the occlusion: whether it occurred in a main artery (ophthalmic artery, posterior ciliary artery, or central retinal artery) or a more terminal branch [11]. Autologous fat, the most viscous material, has the highest risk of diffuse occlusion at the level of the ophthalmic artery and poor prognosis.

Ways to Minimize Risk

Previous articles have focused on the prevention of embolism by minimizing the risk of intra-arterial injection. These precautions include: avoiding large bore needles, using blunt cannulas, adding epinephrine to fillers to cause vasoconstriction of vessels, using smaller syringes that do not require high pressures on the plunger, injecting slowly, and withdrawing on the plunger before injecting to check for intra-arterial location [8]. Knowing the anatomy and common variants of the facial vasculature is essential to proper injection. Injections in traumatized tissue should also be avoided due to an increased risk of intravasation of material [12].

Early diagnosis of embolization is critical to improve patient outcomes and maximize treatment efficacy. In the event of an embolism into the retinal artery, acute onset of ocular pain is the main complaint. Cerebral embolization

may present immediately or after a latency period of several hours [12]. Patients with cerebral embolization may present with new onset cranial nerve deficits or hemiparesis.

Inexperienced and/or non-medical injectors may not be aware of these rare adverse events with facial injection [8]. To further minimize the risk of intravascular injections and further embolization, only experienced physicians who are trained in the core aesthetic specialties (e.g., plastic surgery, dermatology, facial plastic surgery, oculoplastic surgery) should be allowed to perform these procedures. The issue of inexperienced injectors is a common problem in some areas, including the South Florida market where this case was seen, due to a lack of regulatory oversight.

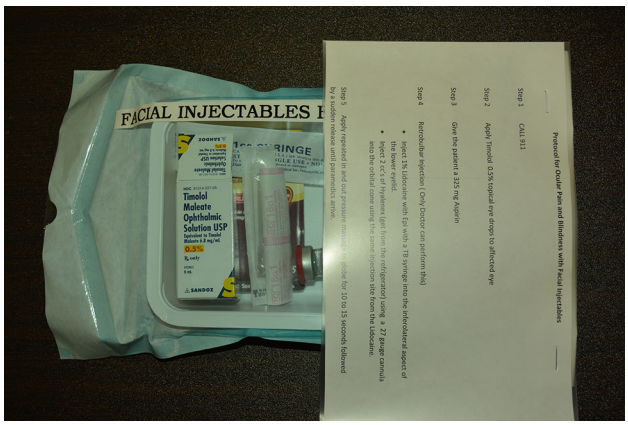
FACIAL INJECTABLES
Timolol Maleate Ophthalmic Solution USP
Protocol for Ocular Pain and Blindness with Facial Injections
Step 1
CALL 911
Step 2
Apply Timolol 0.5% topical eye drops to affected eye
Step 3
Give the patient a 325 mg Aspirin
Step 4
Retrobulbar Injection (Only Doctor can perform this)
Step 5

Fig. 6 Treatment kit

Treatment Algorithm for Ocular Pain and Blindness After Facial Fillers

The following treatment algorithm has been adapted from Lazzeri et al. [7] and implemented in our practice (Fig. 5).

1. Indications for treatment:
   a. Sudden onset ocular pain
   b. Vision loss
2. Important considerations:
   a. The goal is to quickly reduce intraocular pressure to allow for the embolus to dislodge downstream and improve retinal perfusion.
   b. Treatment must start within 90 min. The earlier the treatment starts, better the prognosis. [7]
3. Protocol
   a. Call 911. Prepare to transfer the patient to the hospital setting as soon as possible.
   b. Start the 6-Step Therapy Protocol at the office and continue in the hospital (Fig. 6).
1. Administer Timolol 0.5% 1–2 drops in the affected eye only [13]. A beta-adrenergic antagonist will reduce aqueous humor production in the eye and reduce intraocular pressure.
2. Give the patient one tablet of 325 mg of aspirin. [14]
3. Massage the eye globe with repeated increasing pressure to the globe for 10–15 s, followed by sudden release with an in and out movement using a three-mirror contact lens [13]. Repeat for 3–5 min.
4. If hyaluronic acid was injected, hyaluronidase should be injected into the retrobulbar space. This procedure should only be performed by a trained physician, i.e., ophthalmologist or oculoplastic surgeon [15]. If the patient is transferred promptly to the emergency department, then the on-call ophthalmologist should be contacted.

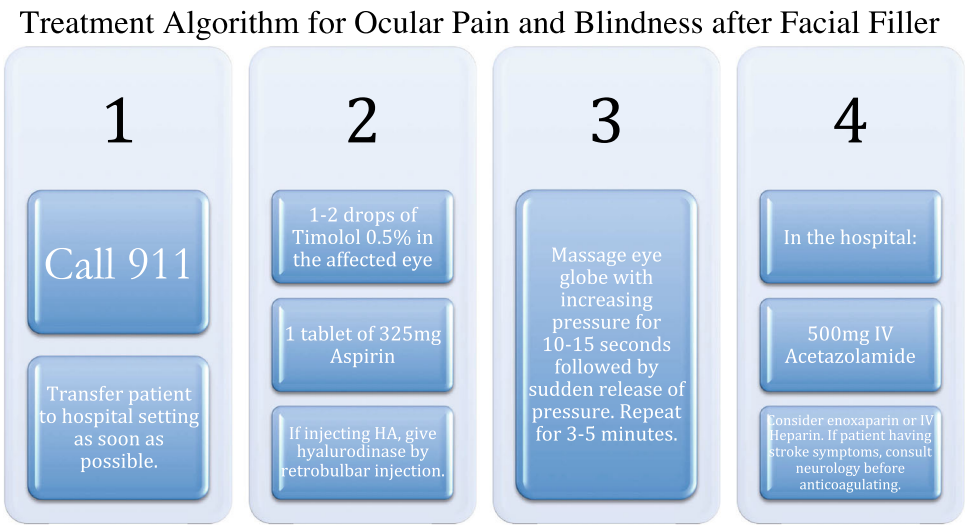
Treatment Algorithm for Ocular Pain and Blindness after Facial Filler
1
Call 911
Transfer patient to hospital setting as soon as possible.
2
1-2 drops of Timolol 0.5% in the affected eye
1 tablet of 325mg Aspirin
If injecting HA, give hyalurodinase by retrobulbar injection.
3
Massage eye globe with increasing pressure for 10-15 seconds followed by sudden release of pressure. Repeat for 3-5 minutes.
4
In the hospital:
500mg IV Acetazolamide
Consider enoxaparin or IV Heparin. If patient having stroke symptoms, consult neurology before anticoagulating.

Fig. 5 Treatment algorithm for ocular pain and blindness after facial filler

a. The procedure for retrobulbar injection of hyaluronidase begins with injection of local anesthetic to the lateral lower eyelid [8, 16]. Then a 27-gauge cannula is inserted at least 1 inch towards the posterior aspect of the orbital cone. Lastly, hyaluronidase 2–4 mL (150–200units/mL) is injected.

5. Once patient has been transferred to the hospital setting:

   a. Inject 500 mg IV acetazolamide [17]. This should increase retinal blood flow and reduce intraocular pressure.
   b. Consider administering Lovenox (enoxaparin) subcutaneously or heparin IV for anticoagulation [13]. If the patient is having signs or symptoms of a stroke, defer this step until a neurologist has evaluated the patient.

Conclusion

Retrograde embolization of material during facial injection can be avoided with proper technique and injector expertise. If embolization does occur, a treatment protocol and kit prepared in advance can mean the difference between resolution and permanent deficit.

Acknowledgements This research received no specific Grant from any Funding agency in the public, commercial, or not-for-profit sectors.

Compliance with Ethical Standards

Conflict of interest The authors have no conflicts of interest to declare.

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